Phenolics do not explain enhanced carbon sequestration in wetland soils

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Wetland soils are a major terrestrial carbon sink. Hence, it is essential to understand the reason(s) for the enhanced carbon sequestration by wetland soils. Freeman *et al.* [1] proposed that the lack of dissolved oxygen in peatland soils inhibits phenol oxidase activity, resulting in the accumulation of phenolics, which in turn inhibit the production of hydrolase enzymes that are responsible for initiating soil organic matter degradation. We tested this hypothesis by collecting soils at two wetland sites: the RARE Charitable Research Reserve and Luther Marsh, both in Ontario, Canada. The two soils have distinctive features and geochemical properties: the RARE soil is from a submerged riparian zone adjacent to a small groundwater-fed stream (pH 7.5, conductivity 450 µs/cm, 21% organic matter), while the Luther Marsh soil is a bog peat (pH 3.9, conductivity 73 µs/cm, 85% organic matter). We subjected the soils to three different treatments: aeration, addition of phenolics, and addition of phenol oxidase. We measured hydrolase enzymes activities plus the concentrations of phenolics and phenol oxidase. We observed no significant effect of the phenolics on the hydrolase enzyme activities, similar to the findings of Hall *et al*. [2] for tropical forest soils. Moreover, aeration of the soils did not increase phenol oxidase activities. Thus, our results do not support the carbon preservation mechanism proposed by Freeman *et al.* 2004.

[1] Freeman *et al*. (2004) *Soil Biol. Biochem.* **36**, 1663-1667 [2] Hall *et al*. (2014) *Ecol. Soc. Am.* **95**, 2964-297.